

Beginning & Intermediate
Algebra

10.5—Rationalizing Denominators

Simplify $\sqrt[3]{25} \cdot \sqrt{5}$

- a) 5
- b) 25
- c) -25
- d) -5

$$\begin{aligned}
 &= \sqrt[3]{25 \cdot 5} \\
 &= \sqrt[3]{125} \\
 &= 5
 \end{aligned}$$

Nov 22-11:20 AM

Nov 22-11:20 AM

Simplify $\sqrt[3]{25} \cdot \sqrt{5}$

- a) 5
- b) 25
- c) -25
- d) -5

Simplify $(-8)^{-2/3}$

- a) 4
- b) $\frac{1}{4}$
- c) -4
- d) $-\frac{1}{4}$

$$\begin{aligned}
 &= \frac{1}{(-8)^{2/3}} \\
 &= \frac{1}{(\sqrt[3]{-8})^2} \\
 &= \frac{1}{4}
 \end{aligned}$$

Nov 22-11:20 AM

Nov 22-11:20 AM

Simplify $(-8)^{-2/3}$

- a) 4
- b) $\frac{1}{4}$
- c) -4
- d) $-\frac{1}{4}$

Simplify. Assume all variables
represent nonnegative numbers.

$$\sqrt{3m^2} \sqrt{9m^3}$$

- a) $3m\sqrt{3m}$
- b) $3m^2\sqrt{3m}$
- c) $\sqrt{27m^6}$
- d) $3m^2\sqrt{3m^3}$

$$\begin{aligned}
 &\sqrt{27m^6} \\
 &= 3m^2\sqrt{3m}
 \end{aligned}$$

Nov 22-11:20 AM

Nov 22-11:20 AM

 Simplify. Assume all variables represent nonnegative numbers.

$$\sqrt{3m^2} \sqrt{9m^3}$$

a) $3m\sqrt{3m}$
b) $3m^2\sqrt{3m}$
 c) $\sqrt{27m^6}$
 d) $3m^2\sqrt{3m^3}$

Nov 22-11:20 AM

 Multiply. $(3\sqrt{2}+3)(\sqrt{2}-5\sqrt{3})$

a) $-9-15\sqrt{6}+3\sqrt{2}$
 b) $6+3\sqrt{2}-15\sqrt{3}-15\sqrt{6}$ ✓
 c) $5-14\sqrt{6}-15\sqrt{3}$
 d) $25\sqrt{3}$

Nov 22-11:20 AM

 Multiply. $(3\sqrt{2}+3)(\sqrt{2}-5\sqrt{3})$

a) $-9-15\sqrt{6}+3\sqrt{2}$
b) $6+3\sqrt{2}-15\sqrt{3}-15\sqrt{6}$
 c) $5-14\sqrt{6}-15\sqrt{3}$
 d) $25\sqrt{3}$

Nov 22-11:20 AM

When is a Radical Expression **SIMPLIFIED**?

1. The **RADICAND** has no **FACTOR** raised to a power greater than or equal to the **INDEX**.
2. The **RADICAND** has no **FRACTIONS**.
3. **EXPONENTS** in the radicand and the **INDEX** have no common factor.
4. There are no **RADICALS** in the denominator.

$$\sqrt[6]{m^3} = m^{\frac{3}{6}} = m^{\frac{1}{2}} \sqrt{m}$$

Nov 22-11:20 AM

Simplifying a Radical Expression

What rule does this break?

$$\frac{3}{\sqrt{7}} \cdot \frac{\sqrt{7}}{\sqrt{7}} = \frac{3\sqrt{7}}{\sqrt{7 \cdot 7}} = \frac{3\sqrt{7}}{\sqrt{49}} = \frac{3\sqrt{7}}{7}$$

$\sqrt{7} \approx 2.4575$
 $2.4575 \overline{) 3}$

Nov 22-11:20 AM

Rationalizing a Denominator

$$\frac{5\sqrt{2}}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \frac{5\sqrt{10}}{5} = \sqrt{10}$$

$$\frac{6}{\sqrt{12}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{6\sqrt{3}}{\sqrt{12 \cdot 3}} = \frac{6\sqrt{3}}{\sqrt{36}} = \frac{6\sqrt{3}}{6} = \sqrt{3}$$

$$\frac{6}{\sqrt{12}} \cdot \frac{\sqrt{12}}{\sqrt{12}} = \frac{6\sqrt{12}}{12} = \frac{\sqrt{12}}{2} = \frac{\sqrt{4 \cdot 3}}{2} = \frac{2\sqrt{3}}{2} = \sqrt{3}$$

Nov 22-11:20 AM

Examples

$$\sqrt{\frac{11}{18}} = \frac{\sqrt{11}}{\sqrt{18}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{11}{\sqrt{7b}} \cdot \frac{\sqrt{16}}{\sqrt{16}}$$

$$\frac{\sqrt{22}}{\sqrt{36}} = \frac{11\sqrt{16}}{7b}$$

$$\frac{\sqrt{22}}{6}$$

Nov 22-11:20 AM

Rationalize the denominator $\sqrt[3]{\frac{8}{3}}$

- a) $\frac{2\sqrt{3}}{3}$
 b) $\frac{3\sqrt{2}}{3}$
 c) $\frac{2\sqrt{6}}{3}$
 d) $\frac{3\sqrt{6}}{3}$

$$\frac{\sqrt{8}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{24}}{3} = \frac{2\sqrt{6}}{3}$$

Nov 22-11:20 AM

Rationalize the denominator $\sqrt[3]{\frac{8}{3}}$

- a) $\frac{2\sqrt{3}}{3}$
 b) $\frac{3\sqrt{2}}{3}$
 c) $\frac{2\sqrt{6}}{3}$
 d) $\frac{3\sqrt{6}}{3}$

Nov 22-11:20 AM

Rationalizing a Higher Root

$$\sqrt[3]{\frac{6}{5}} = \frac{\sqrt[3]{6}}{\sqrt[3]{5}} \cdot \frac{\sqrt[3]{25}}{\sqrt[3]{25}} = \frac{\sqrt[3]{150}}{\sqrt[3]{125}} = \frac{\sqrt[3]{150}}{5}$$

Nov 22-11:20 AM

Rationalizing a Binomial Denominator

$$\frac{3}{(2-\sqrt{5})(2+\sqrt{5})} = \frac{6+3\sqrt{5}}{(2-\sqrt{5})(2+\sqrt{5})}$$

$$\frac{6+3\sqrt{5}}{2^2 - (\sqrt{5})^2} = \frac{6+3\sqrt{5}}{4-5} = \frac{6+3\sqrt{5}}{-1} = -6-3\sqrt{5}$$

Nov 22-11:20 AM

Example

$$\frac{4\sqrt{3}}{(\sqrt{2}+4\sqrt{6})(\sqrt{2}-4\sqrt{6})} = \frac{4\sqrt{3}}{(\sqrt{2})^2 - (4\sqrt{6})^2} = \frac{4\sqrt{3}}{2-96} = \frac{4\sqrt{3}}{-94} = -\frac{2\sqrt{3}}{47}$$

Nov 22-11:20 AM

$$\begin{array}{r}
 \frac{4\sqrt{6} - 48\sqrt{2}}{-94} \\
 \frac{2(2\sqrt{6} - 24\sqrt{2})}{2(-47)} \\
 \frac{2\sqrt{6} - 24\sqrt{2}}{47} \\
 - \frac{2\sqrt{6} + 24\sqrt{2}}{47}
 \end{array}$$

May 17-12:39 PM

Homework Quiz Time

$$8^{-\frac{5}{3}} \quad \sqrt{45} \cdot \sqrt{18}$$

$$(\sqrt{3} + 7)^2$$

Nov 22-11:20 AM

$$10.4 \quad (3 + \sqrt{7})^2$$

May 17-12:41 PM